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Review of Monograph

Poisonous and Venomous Marine Animals of the World

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From the Russian

Review of Monograph

Poisonous and Venomous Marine Animals of the World

by B. W. Halstead, Vol. I--Invertebrates; sections on Chemistry
by D. A. Courville. Sponsored by U. S. Department of Defense.
U. S. Government Printing Office, Washington, D. C., 1965, XXXVI
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Review of Monograph

Poisonous and Venomous Marine Animals of the World

The book under review is the most complete manual on poisonous and venomous marine invertebrates in the world. This well published volume consists of more than 1000 pages in octavo with many excellent color illustrations. Halstead is a prominent specialist in the field of biotoxicology, director of the World Life Research Institute in Coulton, California, and associate of the Institute of Tropical and Preventive Medicine at the University of Loma Linda.

Sections in the book dealing with chemistry are written by Courville, professor of biochemistry at the Loma Linda University and author of a number of papers on the chemical properties of marine biotoxins.

Study of the seas' poisonous creatures attained full stature only at the outbreak of WW II, especially in the Pacific theater, where people suddenly came into contact with small--but dangerous--tropical marine life. Japan's armed forces were better prepared to cope with this danger than their American counterparts. As a result of hurriedly organized research, under the direction of the prominent zoologist Toshio Kumada, poisonous fish and invertebrates of the Indian and western Pacific oceans were studied, and an illustrated manual compiled for both the [Japanese] armed forces and civilian population. The Japanese army began taking delivery of issues of this manual as early as the summer of 1942. In spite of precautionary measures, more than 400 Japanese military personnel perished as a result of poisoning from deadly fish and invertebrates. The author does not list the extent of related American casualties, however, judging from the urgency and scope of the research in marine biotoxicology initiated by the U. S. Armed Forces in 1943, they, too, must have been considerable. Halstead took part in this work from its very inception. The volume under review was written by Halstead at the request of the Defense Department. Thus, the military significance of Halstead's research as well as the problem as a whole cannot be doubted.

The book is, however, largely of primary scientific importance. The preface is an extensive (135 pages), richly illustrated (175 illus.) historical section in which results of observations and marine biotoxicologic studies are presented dating back many centuries,

from the time of the ancient Egyptians and Sumerians up to the Second World War. The author cites, in part, contributions of Russian scientists. The "Atlas yadovitykh ryb s opisaniem vida ikh, deystviya yada na organism cheloveka i ukazaniem protivoyadiy" ["Atlas of Poisonous Fish with a Description of the Various Types, their Poisons, How the Poison Acts on Man, and Antedotes"] compiled by P. N. Savchenko in 1886 is characterized by Halstead as a work which, "...remains a classic in the annals of military preventive medicine," (a portrait of Savchenko is included in the book along with a photograph of the "Atlas" title page). Halstead indicates his particular respect for the work of Ye. N. Pavlovskiy thus: "One of the outstanding leaders in venomological research is Yevgeniy Nikanorevich Pavlovskiy." Halstead includes a biographical sketch of this Russian academician. Ye. N. Pavlovskiy's book on poisonous animals "Gifttiere und Ihre Giftigkeit" ["Poisonous Creatures and their Poison"] is evaluated by Halstead as, "...one of the most comprehensive available in the field of zootoxicology and continues to be a valuable and much cited work."

The last chapter in the book's historical section is "An Annotated List of Contemporary Workers in Marine Biotoxicological Research". The list contains birth dates, biographical briefs, and photographs of 70 specialists from various countries of the world.

The main body of the book is divided into six chapters devoted to Protozoa, Porifera, Coelenterata, Echinodermata, Mollusca, and other invertebrates (worms and crustaceans). In each chapter, the history of toxicological study of the given phylum is presented, and all toxic species of each group are systematically enumerated along with an outline of their biological characteristics. The morphology of the venom apparatus and poison glands is described, as are medical aspects of the poisoning (clinical profile of the affection, diagnosis, pathology, treatment and prevention). Public health aspects are touched upon (medical control, methods of laboratory analysis to determine the toxicity of an animal, etc.). Detailed information on the toxicology, pharmacology and chemistry of poisonous substances is supplied for each group of animals.

Listings of the various poisonous marine creatures include their Latin name and, of particular value, the English or colloquial (for example, Polynesian or Japanese) name of the species with basic synonyms for the Latin name. Moreover, the listings indicate the

animals' global distribution and references wherein material relative to the toxicity of a given species may be found. Though the nomenclature used in discussing some of the species may appear somewhat antiquated from a systematic point of view, the accuracy of definition is beyond question.

Bibliographies are presented separately for each chapter. The more than 1600 individual entries cover 70 pages.

The poisonous Protozoa are few in number, but extremely dangerous. Among the toxic, marine Protozoa, the dinoflagellates Gonyaulax catenella and Gonyaulax tamarensis do the most harm. They are not only toxic in their own right, rendering great destruction of marine animals, but transfer their toxicity to "filter-feeding" animals which depend on plankton for nutrition. Up to 1962, according to literature, more than 1000 people became ill and more than 200 had perished from eating Mytilidae, Veneridae, and other edible, bivalve mollusks containing paralytic shellfish poison. Cases of mussel poisoning resulting from eating dinoflagellate transvector shellfish occur not only in the tropics and subtropics, but even in Norway, eastern Canada, and Alaska. Because mollusks find wide use in the human diet, special services have been set up in the USA, Canada and several western European countries to control the quality of edible shellfish that are marketed. Halstead's book details the various facets of this service.

Many coelenterates pose extreme danger. Toxicity is displayed by about 70 species of Hydrasoa, Scyphosoa, siphonophores, and sea anemones, among which are the notorious species such as: the "garden-spider" medusa, Gonionemus vertens and the siphonophore Physalia or "Portuguese man-o-war" (Physalia physalis, Fh. utriculus). More than 400 stings of humans are cited by the literature from 1953 to 1960, including 30 fatalities. In actuality, the number of such cases is far greater. The book contains photographs of people stung [literally, "burned" or "singed"] by the small (7.5 cm across the bell) medusa, Chironex fleckeri, which is probably the most poisonous of known marine animals. Contact with this jellyfish often leads to death within minutes or even seconds. The photographs showing the results of stings from Cyanea capillata, the largest of existing medusae, are expressive in their own right. Almost all cases of severe injury due to Coelenterata occur in tropical and subtropical waters, but venomous varieties are also found in boreal and arctic seas.

There are many dangerous species among the mollusks and echinoderms. Nine species of starfish, two brittle stars, 28 sea urchins, 28 sea cucumbers, 30 species of gastropod, four bivalves and 12 cephalopods are listed as poisonous. In tropical waters, swimmers are exposed to danger from the spines of the urchins: Diadema, Echinothrix, Centrostephanus and from the starfish Acanthaster. The spines are like poisoned needles which penetrate into the skin and break off causing extreme discomfort. In islands of the Pacific, cases are known where death resulted from the sting of a gastropod cone.

Probably only a few are aware that on the bottom of the USSR seas dwell poisonous creatures. They pose no threat to man, however. The starfish Asterias amurensis, Crossaster papposus, Patiria pectinifera, etc. secrete asterotoxin, a substance poisonous not only to other marine creatures ingesting these stars, but also, for example, to cats. The globiferous pedicellariae of the sea urchins, Strongylocentrotus droebachiensis, Echinus esculentus, Spatangus purpureus, etc., are also poisonous. The toxin, holothurin, is contained in the tissues of trepang and other sea cucumbers. Venom is stored in the salivary glands of the gastropods Buccinum and Neptunea.

There are recurrent instances of food poisoning from edible invertebrates, among them, mussels (the oyster Crassostrea gigas, the venerid Tapes semidecussata).

Among the other types of invertebrates, there are but few venomous and poisonous species (12 species of sponge which can cause dermatitis in people who handle or process them regularly, six species of poisonous flatworm, four nemertean, nine polychaete worms, three sipunculids, three species of horseshoe crab which are poisonous during the reproductive season, the parasitic barnacle Saccalina, and four species of crab which may be toxic at definite seasons of the year). These creatures pose little danger to man.

The book contains 215 plates which comprise almost half of the entire volume. Among them are many excellent underwater photographs showing poisonous marine fauna in their natural setting as well as watercolor illustrations and plates. There are also many fine diagrams and drawings of the structure of poisonous organs: the nematocysts of the coelenterates, the spikes and pedicellariae of the echinoderms, the radular teeth of the cone shells, etc. The book includes maps showing the distribution of some of the more dangerous organisms, and points are designated where instances of attack on humans have occurred.

Today, as commercial and fishing vessels of the USSR roam the waters of the world's oceans, Soviet sailors and fishermen come into ever more frequent contact with dangerous marine fauna. Injury due to contact with Physalia and other marine creatures has often been recorded in the past. Soviet fishermen have started to take for market sea mussels, scallops, squid, octopi, sea urchins, trepangs and many other edible invertebrates which have begun to make up part of the Soviet people's diet. It is of paramount importance to inform sailors, fishermen, physicians and the general populace, i.e., whoever may in one way or another come into contact with marine fauna, of the possible dangers. Unfortunately in the USSR, there is but little published concerning poisonous marine organisms, especially invertebrates. In the majority of handbooks for scuba divers and skin divers, there is no mention of poisonous marine creatures, only in a few is there information concerning marine inhabitants and chiefly in the Black Sea. Halstead's book will doubtless be of interest to specialists, but its access to Soviet readers will be unavoidably limited in that a complete translation of a volume of such girth and scope is hardly feasible. In spite of this, Soviet reference works on marine biotoxicology and widely accessible atlases of dangerous marine fauna are urgently needed. They must appear within the near future. For this effort, Halstead's book will prove an invaluable source.